PHENIX

PHENIX DC Operation in the PEH

PHENIX Procedure No. PP-2.5.2.4-01

Revision: D **Date: 06/4/2013**

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

- *Typo: Under Section 3.2, "PHENIX Emergency Plan C-A 3.16" should be written as "Emergency Procedure for the PHENIX Detector Building 1008 Complex, C-A-OPM 3.16"*
- *Reference Not Found: Under 2.1, it makes reference to, "….a prescribed check off list (Attachment 1)." But, Attachment 1 is missing in Section 9 Appendix A.*
- *Not Referenced: C-A 3.16 is not referenced in section 8 References*
- *Outdated: Reference 8.2 has incorrect title and the revision is outdated (the current revision is Rev 2.1). Under 8.2, BNL SBMS, ESH Section 1.4.0, "Compressed Gas Cylinder Safety, Rev. 1" March, 1999. It should be written as BNL SBMS, ESH Standards, Section 1.4.0, "Compressed Gas Cylinder Safety"*
- *Mismatched & Outdated: Reference 8.3 has incorrect title and the revision is outdated. BNL Occupational Health & Safety Guide (Interim), Section 4.11.0, "Installation of Flammable Gas Systems (Experimental & Temporary Installations" June 21, 1989. The current revision is July 16, 2010, Rev 3.2. It should written as BNL SBMS, ESH Standards, Section 4.11.0 "Installation of Flammable Gas Systems (Experimental & Temporary Installations)"*

Approvals

6/5/13		6/3/13	
PHENIX S&E & I	Date	Cognizant Scientist	Date
6-6-13			
PHENIX Safety	Date		

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REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	5/4/00	n/a	J.Haggerty, M. Sivertz, W. Lenz, Y. Makdisi	n/a
B	Main body of this procedure is unchanged from rev A. Attachments 4.1 thru 4.3 which listed specific subsystem experts and contact info has been replaced by Attachment 4 which now lists the website where up-to-date versions of such information can be found now and in the future.	11/16/2009	D. Lynch	P. Giannotti, D. Lynch, R. Pisani	P. Giannotti
C	Revised to remove references to gas system procedures. These are now in PP 2.5.2.4-04. Specifically deleted sections 1.1.1, 1.2.1, 2.5, 3.4, 4.1, 6.1, 6.2, 6.3, 8.4, 8.5, 8.6, and sec. 6 introductory paragraph, sec. 7 reference to gas system removed. Attachments 1, 5 and 6 deleted. All sections renumbered to fill removed slots.	6/24/2010	R. Pisani	R.Pisani, D. Lynch, P. Giannotti	P. Giannotti

LETTER	DESCRIPTION	DATE	WRITTEN BY	APPROVED BY	CURRENT OVERSIGHT
D	3 year review with no changes to content. New rev letter and date	6/4/2013	D. Lynch	R.Pisani, D. Lynch, P. Giannotti	P. Giannotti

1. Purpose

The purpose of this document is to specify the operation of the High Voltage and Low Voltage Systems for the PHENIX Drift Chambers

This document describes:

1.1 On start-up:

1.1.1 the first time high voltage is applied to the chambers after flammable gas is flowing,

1.2 For normal running:

1.2.1 the standard procedure for turning on and off high voltage

1.2.2 the standard procedure for turning on and off the low voltage

Because the PHENIX Drift Chambers and PHENIX Pad Chambers share a single gas system, much of this document is exactly the same as the corresponding Pad Chamber Procedure.

2. Responsibilities

During any data taking period there will be at least four people on shift in the PHENIX counting house. Prior to data taking, there will be a period of chamber commissioning when the chambers are flushed with operating gas and tested at high voltage. After the introduction of flammable gas to the Drift Chambers (or any other subsystem) there shall be at least two people on shift at all times.

High Voltage (HV) and Low Voltage (LV) power shall not be left operating unattended.

During commissioning, it is the responsibility of the Drift Chamber Experts to bring on the HV in a safe manner, as described in Sec. 6.4.

During commissioning, it is the responsibility of the Drift Chamber Experts to bring on the LV in a safe manner, as described in Sec. 6.6.

During data taking, it will be the responsibility of the PHENIX Shift Crew to:

2.1 Monitor the status and alarms of the gas system according to a prescribed check off list (Attachment 1) at least once a shift (eight hours).

2.2 Monitor the status and alarms of the HV system throughout the shift, according to a prescribed checklist (Attachment 2).

2.3 Monitor the status and alarms of the LV system throughout the shift, according to a prescribed checklist (Attachment 3).

2.4 In the event of an alarm or irregularity, contact an expert from the Expert Call List (Attachment 4).

2.5 maintain the Drift Chamber HV System in a safe operating condition. This includes

2.5.1 verifying the readiness of the chamber for HV,

2.5.2 turning on the HV according to the operating procedures described below,

2.5.3 posting any special instructions or notifications as required, and

2.5.4 carrying out any emergency actions, as prescribed in the Procedures section of this document.

2.6 maintain the Drift Chamber Low Voltage System in a safe operating condition. This includes:

2.6.1 Verifying the readiness of the chamber for low voltage power

2.6.2 Turning on the LV according to the operating procedures described below,

2.6.3 Posting any special instructions or notifications as required, and

2.6.4 carrying out any emergency actions, as prescribed in the Procedures section of this document.

3. Prerequisites

The Drift Chamber Gas Experts shall have read or have training in the following areas:

3.1 C-A Local Emergency Plan for the Collider-Accelerator Department, C-A_3.0,

3.2 PHENIX Emergency Plan C-A_3.16

3.3 geographical layout of the experimental area (routes of egress, location of emergency equipment, phones and controls)

4. Precautions

The PHENIX Safety Monitoring and Control System (SMCS) is interlocked with the power to the Gas Room of the Mixing House (MH). In the event of any Level 3 alarm, all power to the Gas Room of the MH is shut off.

The Level 3 alarms include:

- Detection of flammable gas by the VESDA system in the Interaction Region (IR),
- Detection of smoke by the HSSD system in the IR.
- Flammable gas alarms in the MH.
- Heat sensor alarms in the MH.

4.1 High Voltage System Precautions:

4.1.1 The SMCS is interlocked with the High Voltage (HV) power supplies. Activation of the alarms automatically shuts down the power to all HV supplies,

4.1.2 The total stored electrical energy in the high voltage systems is low. The HV power supplies are current limited to less than 10 microamps per channel. An insulating layer covers all HV points in order to eliminate the danger to personnel. When the Drift Chambers are mounted on the carriage the HV points are inaccessible to personnel

4.1.3 Before any HV can be turned on, sufficient gas must have flowed through each of the detectors to remove oxygen from the chambers. This will be accomplished by purging the chambers with inert gas prior to the introduction of flammable gas. The gas flow rate is 7.5 Standard Cubic Feet per Hour (SCFH) to each chamber. Each chamber has a gas volume of 75 cubic feet. Thus it will take 10 hours for a single exchange of gas, or 30 hours for 3 volume exchanges. So flammable gas shall not be introduced into the chambers until they have been purged with inert gas for at least 30 hours. This ensures that there will not be a flammable mixture in the chambers or gas system.

4.1.4 For the safety of the chambers, HV will not be turned on, except for low voltage testing, until operating gas has filled the chamber. Voltages less than 500 volts may be applied to the chambers for short periods of time provided the operation is monitored at all times by a Drift Chamber expert. In order to raise the HV to operating voltage, the chamber must be filled with operating gas. This means that operating gas must have been flowing for at least 30 hours prior to increasing the HV above 500 volts.

4.1.5 All HV controls associated with the DC HV system are to be operated by designated DC HV experts only, or by the PHENIX shift leader following specific instructions from DC experts (see Attachment 4)..

4.2 Low Voltage System Precautions:

4.2.1 The SMCS is interlocked with all power to the PHENIX hall including the Low Voltage (LV) power supplies. Thus, activation of the alarms automatically shuts down the power to all LV supplies. The LV system is used to provide power to the Drift Chamber Front End Modules (FEMs) that are monitored by 483 temperature probes. Overtemperature indication on selected probes will shut off power to the entire drift chamber.

4.2.2 Any reconfiguration of the DC LV beyond turning the power on/off is to be performed by DC LV experts only, or by the PHENIX shift leader following specific instructions from DC experts (see Attachment 4).

5 Emergency Procedures

In the event of an emergency, follow the procedures outlined in PHENIX Emergency Procedure 3.16 detailed below.

5.1 In the event of a fire or fire alarm in Building 1008, members of the PHENIX Shift Crew shall (in order of priority)

5.1.1 Pull the nearest fire alarm if the alarm is not already sounding (Attachment 1 gives the layout of the building 1008 showing the location of the gas system area and the fire alarm pull stations in the area),

5.1.2 Go to a safe location and call 911 or 2222.

5.1.3 Await the arrival of the Fire/Rescue Group. If the fire is small, the Shift Crewmember may return to the area and attempt to extinguish the fire using a fire extinguisher.

5.1.4 The Shift Leader shall report to the Fire/Rescue Captain upon arrival at the Command Post.

5.2 In the event of an emergency related specifically to the Drift Chamber gas or electronics,

5.2.1 The SMCS is interlocked with the Gas, HV and LV power supplies. Activation of the alarm automatically shuts down the flammable gas flow and all power to HV and LV supplies. No further action is needed for this.

5.2.2 Notify the Drift Chamber Expert On Call that an emergency affecting the Drift Chambers has occurred

6 Standard Operating Procedures

6.1 HV System Procedures: Turning on HV:

If the HV is being turned on for the first time, verify by checking with a Drift Chamber Gas Expert that operating gas has been flowing to the Drift Chambers for at least 30 hours before attempting to bring on the HV.

6.1.1 Check that the appropriate current limits are in place for the power supply. These limits are given in Attachment 2. The Drift Chamber Experts shall maintain a HV logbook where the operating parameters of the HV settings are recorded. This shall include the current limits, target voltages, ramp rates, operating voltages and currents, and trip tolerances.

6.1.2 As a check, the chamber is to be turned on at very low voltage to identify any broken wires. Set the target voltage for each HV output channel to 10 volts.

6.1.3 Check that the ramp up rate for each HV channel is appropriate (10 volts per second).

6.1.4 Ramp up the HV.

6.1.5 If any of the HV channels trips, disable that and the neighboring HV channels until the reason for the trip is understood. Then begin the procedure again from 6.4.1

6.1.6 If there are no HV trips, verify that the operating currents are appropriate.

6.1.7 Change the target voltage to the correct operating voltage for each chamber, as given in Attachment 2.

6.1.8 Continue ramping up the HV.

6.1.9 When ramping is complete, verify that the operating currents are appropriate, as given in Attachment 2.

6.1.10 HV is ready for chamber testing.

6.2 HV System Procedures: Turning off High Voltage to a chamber:

6.2.1 Begin ramping down the HV.

6.2.2 Verify by the read back that the HV is off the system.

6.2.3 In the event of irregularities, call a Drift Chamber Expert.

6.3 LV System Procedures: Turning on Low Voltage:

6.3.1 Verify that the AC is on to the LV crate.

6.3.2 Click on the appropriate button to turn LV power on to the channel required.

6.3.3 Verify that the button changes color to indicate power is on (RED). This may take ten to twenty seconds. If not, call a Drift Chamber Expert.

6.3.4 Verify that the temperature monitors are within tolerance by checking Attachment 3. If not, call a Drift Chamber Expert.

6.4 LV System Procedures: Turning off Low Voltage:

6.4.1 Click on the appropriate button to turn LV power off to the channel required.

6.4.2 Verify that the button changes color to indicate power is off (GREEN). This may take ten to twenty seconds. If not, call a Drift Chamber Expert.

7 Documentation

The Drift Chambers shall maintain a separate logbook for the HV Status, and LV Status

8 References

8.1 C-A_3.0, "Local Emergency Plan for the Collider-Accelerator Department."

8.2 BNL SBMS , ESH Section 1.4.0, "Compressed Gas Cylinder Safety, Rev. 1", March, 1999.

8.3 BNL Occupational Health and Safety Guide (Interim), Section 4.11.0, "Installation of Flammable Gas Systems (Experimental & Temporary Installations)", June 21, 1989.

9 Appendix A

9.1 Attachment 2: - Check list for the Drift Chamber High Voltage System

9.2 Attachment 3: - Check list for the Drift Chamber Low Voltage System

9.3 Attachment 4: - Call list for the Drift Chamber, HV, and LV Experts.

Attachment 1.

Attachment 2: DC HV Settings

Each DC chamber has 4 separate types of HV: Cathode, Potential, Gate, and Back.

The nominal voltages for each of these is:

Cathode Voltage	**+4000 V**
Potential Voltage	**+2300 V**
Gate Voltage	**+1600 V**
Back Voltage	**+800 V**

NB: These voltages are subject to change as we learn about the chamber operation. Please refer to the DC HV Logbook for additional information on the HV settings.

Attachment 3: DC LV Settings

Each DC chamber has 14 separate channels of Low Voltage (LV).

The nominal voltages each Drift Chamber are all 48 VDC:

All thermocouple readings should be nominal (See Drift Chamber Low Voltage LogBook).

Attachment 4: DC System Experts

Contact Information

Contact Information for experts for this subsystem can be found on the PHENIX Internal Website in the [RUN] link at: (NOTE: replace ## by the current run number)

https://www.phenix.bnl.gov/WWW/run/##/contacts/subsys_experts.html

General PHENIX contact info can similarly be found at:

https://www.phenix.bnl.gov/WWW/run/##/contacts/

Gas system experts can be found at:

http://phenix.bnl.gov/WWW/tracking/gas_system/people.html

In addition, the Run Coordinator and Shift leader for the current run shall have a paper copy available of the contact information for the appropriate systems experts for this and all other PHENIX subsystems.